Province of British Columbia
Ministry of Education

PROVINCIAL ADVISORY COMMITTEE ON COMPUTERS:

INTERIM REPORT

MARCH 31, 1987

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PREFACE

In August of 1985, the Provincial School Review Committee published the Let's Talk About Schools discussion papers. The Summary and Highlights section of that report stated, "that respondents to questions on technology ... unanimously held that pupils should be given greater access to computers."

The response of the Minister of Education to this clear statement from the public was to establish a Provincial Advisory Committee on Computers for the following purposes:

"To describe how computer technology can be integrated into British Columbia schools in the next decade."

and

"To propose a set of policies that will guide the application of instructional computer technology in British Columbia for the next decade."

The Committee began meeting in September, 1986 to determine its plan of action. Beginning in November, 1986 and continuing through January, 1987, members of the Committee, usually in pairs, travelled throughout British Columbia to almost every School District. They visited classrooms at all levels, discussed computer-related topics with pupils, teachers and administrators, and held open meetings with school trustees, teachers, and the general public. At these meetings briefs were presented and comments and opinions recorded. Educators from Faculties of Education were consulted, as were a number of persons from other provinces, and the U.S. Several days were scheduled for presentations from hardware vendors and software developers. Every effort was made to ensure that anyone who wanted to express an opinion to the Committee would have the opportunity to do so.

The Committee then met to develop the Policy Options and Recommendations based on the information from these sources. This Interim Report is being distributed to determine whether its contents fairly represent the opinions that were presented to the Committee. In doing so, the Committee is seeking validation of its findings before submitting the Final Report to the Minister of Education on June 30, 1987.

A questionnaire has been included as an appendix to provide the Committee with feedback on the level of support for the Policy Options and Recommendations. The Committee would appreciate receiving your responses to the questionnaire. If the questionnaire has already been removed, and you would like to respond to it, you may obtain a copy from a school principal, the School District office, or Information Services, Ministry of Education, Parliament Buildings, Victoria, B.C., V8V 2M4.

The members of the Committee wish to express their gratitude for the interest and support of all who were involved in the information-gathering process. We trust that our joint efforts will achieve the stated purposes to the benefit of all pupils in the schools of British Columbia.

Carl Daneliuk, Chairman

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INTRODUCTION

Computers are having a dramatic effect on our society. There is virtually no area of human activity that is not touched by the rapidly-expanding technology. Many people are genuinely concerned about what lies ahead - perhaps because they are uncertain about what is happening now. The major purpose of this Report is to address these concerns so that the youth of today may be adequately prepared to meet the challenges of tomorrow.

The arrival of the computer can be viewed as the most recent stage in the history of information technology. The invention of the alphabet by the ancient Greeks provided a method by which information could move from place to place independently of the person who produced it. The fear was expressed then that the use of the alphabet would ultimately reduce the ability of people to remember information. Instead, the alphabet provided strong impetus to commerce and discovery, as well as to the scholarship and creative writing of the Greeks and Romans. Similarly, when Gutenburg invented the printing press it was broadly suggested that the skill of handwriting would be lost to the printed word. What actually happened was that printing technology produced books at such dramatically reduced costs that it aided the industrial revolution and hastened the arrival of universal public education.

The invention of the computer has, in the same tradition, taken the processing of information another great step forward. Anyone with a computer can create and publish books without the assistance of a typesetter or a printing press. Of even greater significance, the computer can function as an extension of the human mind by providing information storage of almost infinite capacity, and instantaneous retrieval. Old problems, such as the prediction of complex weather systems, are now being solved with the aid of computers. Computer automation and robotics are revolutionizing the workplace with dramatic increases in productivity.

From 1980 to 1982, the Ministry of Education carried out a Pilot Project to determine the extent to which computers could contribute to student learning. With the cooperation of several School Districts, 100 Apple II Plus microcomputers were placed in a variety of school settings. This pioneer study was at least a year in advance of most other organized efforts to introduce computers into the schools. The overall results of the Project, however, were not sufficiently clear on the real benefits of using computers in the classroom, and the Ministry chose not to extend the Project beyond its second year.

The stage had been set, however, and since that time virtually all School Districts in the Province have acquired computers for their classrooms and laboratories through their own resources and with the assistance of parent-teacher groups. Much

of the motivation for schools to use computers has come directly from parents, who feel it important for their children to have opportunities to become familiar with computer technology. As a result there is a considerable amount of computer-related learning occurring in our schools which can be attributed to excellent leadership by teachers and school administrators.

TERM OF REFERENCE A

"Determine the Ministry's involvement in the area of instructional use of computers."

OUTCOME:

"Propose a policy statement."

BACKGROUND:

The lack of direct Ministry involvement in the development of computer applications in the schools has led to great disparity in the quality of computer facilities across the Province. There is an obvious need for more and better hardware and software if the potential of computer applications in the schools is to be realized. There is also the need to train teachers in the use of computers, and to provide them with the support necessary to use computers effectively in their classrooms.

It is important that the Ministry provide the leadership and support necessary to ensure that access to computers in the schools of British Columbia is equally available to all students. The Committee offers the recommendations of this Report to the Minister as the basis for the development of policies and actions that will guide the effective use of computers in the schools of the Province through the foreseeable future.

POLICY OPTIONS:

Option A:

The Ministry should limit its involvement to encouraging Districts and teachers to proceed with the task of using computers effectively in the schools, and to provide some funds to assist in the task.

Option B:

The Ministry should provide leadership and organization for the orderly development of computer applications in the schools. It should undertake a review of the entire school curriculum and within it identify, and recommend for use in the schools, those computer applications that have the potential for improving

student learning. The Ministry should arrange for the necessary funding to carry out the recommendations contained in this Report.

Preferred Option:

The Committee suggests that Option B guide the Ministry in its development of general policy on the instructional use of computers.

RECOMMENDATIONS ON MINISTRY INVOLVEMENT:

Recommendation 1

"That the Ministry of Education place a high priority on carrying out the recommendations of this Report."

Comment: While the costs involved are substantial, the Committee is unanimous in asserting the need for the Ministry to provide leadership and support for the application of computers in the schools.

Recommendation 2

"That the Ministry undertake a rolling five-year plan for the development and support of computer applications in the schools, and that this plan be reviewed and adjusted annually to accommodate changes in the technology."

Comment: Given the high rate of development in computer hardware and software, any attempt at long-term planning and development must include a periodic review.

Recommendation 3

"That the Ministry continue to apply the principles of equalized funding in providing for the costs associated with the development of computer applications in the schools."

Comment: Large variations in the size of School Districts would lead to imbalances in the quality of computer facilities unless smaller Districts are provided with greater *per capita* resources.

TERM OF REFERENCE B

"Determine how the computer can support and enhance a student's education in a more effective manner."

OUTCOME:

"Identify and establish a list of potential uses of the computer. The list should indicate a priority of applications based on a classification system (direct instruction, support applications and management applications)."

BACKGROUND:

Computers have been used for instructional purposes for over 25 years. During that time, the range of instructional applications has grown steadily with increases in the capacity of computers. Entire courses at universities and colleges are taught by computer aided learning (CAL) systems. Many businesses, including the major computer manufacturers themselves, depend on CAL to train their employees in new procedures. Airlines train their pilots and other aircrew on computer-controlled flight simulators in complete safety and with substantial cost savings. Research into the effectiveness of CAL has consistently demonstrated that computers can provide excellent learning experiences, and usually in considerably less time than by more traditional methods. Most of the earlier CAL systems, however, required large computers which meant that costs were rather high, and well beyond the means of most school districts.

The arrival of the microcomputer in the late 1970's changed several factors rather dramatically; it was much less expensive than previous computers, it provided colour graphics at a fraction of the cost, and it could be operated by almost anyone with a reasonable amount of training. Software for microcomputers became sophisticated to the point where small businesses began purchasing them for management and accounting applications. Then, as educational software became available, microcomputer systems began entering the home and the school, and "computer literacy" became a frequent topic among educators.

Initially, computer literacy was defined rather narrowly in terms of one's ability to program a microcomputer. With recent improvements in the quality of educational software, it is evident that the ability to program a computer is not necessary for its effective use. Hence, the focus today is on one's ability to use the computer in meaningful and productive ways.

Computer applications in education can be placed into one of three major categories: teaching through computers, where the computer performs the role of a tutor as in computer aided learning; teaching with computers, where the computer is used as a tool, as in word processing and database management; and teaching about computers where the computer itself is the object of study, as in computer science courses, where programming in one or more of several computer languages, such as Logo, BASIC, and Pascal, is taught. Each of these categories offers opportunities for the enhancement of student learning and the Committee found excellent examples in the classrooms that were visited. However, what is needed at this time, according to most teachers, are guidelines within which they can extend their use of computer applications.

POLICY OPTIONS:

Option A:

Districts should continue to set their own priorities and principles for the application of computers in their schools.

Option B:

The Ministry should establish the priorities and principles for the application of computers in the schools.

Option C:

The Ministry should establish the broad priorities and principles under which the application of computers in the schools should be carried out, and encourage the Districts to use these principles to guide their planning and implementation.

Preferred Option:

The Committee suggests that Option C guide the Ministry in its development of policy directed at the application of computers in the schools.

RECOMMENDATIONS ON THE APPLICATION OF COMPUTERS IN THE SCHOOLS:

Recommendation 4

"That by 1992, all pupils in the schools of British Columbia will have appropriate opportunities for learning through, with, and about computers."

Comment: The year 1992 is viewed as the earliest in which all of the recommendations of this report can be realistically achieved.

Recommendation 5

"That the Ministry adopt the following priorities in providing appropriate opportunities for learning through, with, and about computers. These priorities should be reviewed annually."

The recommended priorities should be:

1. Word processing for the development of writing skills, and other productivity tools such as databases and spreadsheets (Support Applications)

2. Special education applications. (Direct Instruction and Support Applications)

3. School library access to information/knowledge resources such as public database networks and CD-ROM systems (Support Applications).

4. Vocational training, business education, and computer aided drafting (Support Applications)

5. Creative applications for art and music education (Direct Instruction and Support Applications)

6. Computer aided learning that is integrated into the school curriculum (Direct Instruction)

Recommendation 6

"That separate computing facilities be provided for teacher oriented applications such as classroom management and the preparation of instructional materials."

Comment: The use of computers can substantially reduce the time a teacher spends on administrative tasks.

TERM OF REFERENCE C

"Examine the software standards that have been set nationally and internationally."

OUTCOME:

"Propose a policy, and software standards that will support the purchase and development of good instructional software."

BACKGROUND:

High quality educational software is critical to the effective use of computers in the schools. The Committee was informed, repeatedly, of the need for more and better software that is more closely linked to the British Columbia school curriculum.

The Provincial Educational Media Centre (PEMC) currently provides the schools of British Columbia with an important service by evaluating a broad range of educational software, and regularly publishes the results of those evaluations. The evaluations have been carried out by a network of teachers in the field, within the framework of a set of criteria developed by PEMC. While these criteria have been successful in distinguishing between good and poor software, they were not designed to determine the extent to which the software applied, specifically, to the British Columbia school curriculum. What is needed now, as the growth of computer applications in the classroom continues, is the extension of these criteria into a set of standards which would encompass all aspects of instructional use. The ultimate goal of improved educational software standards should be a steady improvement in the quality of this important instructional resource.

Even greater improvement in the quality of educational software could be expected if two or more provinces combined their efforts in the design and development of exemplary software. The benefits of such cooperation, over the long term, would be reflected in a greater opportunity to influence the quality of software that is produced, the creation of a better software base, and the possibility of substantial cost savings.

POLICY OPTIONS:

Option A:

The Ministry should continue the present system of providing software reviews to guide the purchase of software by the local district or school. In other words, maintain the status quo.

Option B:

The Ministry should establish more rigorous evaluation criteria and apply them to selected software appropriate to the curriculum. Teachers would be provided with a list of "Ministry-approved and recommended" educational software. "Supplementary" software would continue to be evaluated under the current system of field trials by one or more teachers. The information generated by these enhanced evaluation procedures would be made available, as quickly as possible, to teachers and administrators. Cooperation with other educational jurisdictions on the development of exemplary software, based on better software standards, should be actively pursued.

Preferred Option:

The Committee suggests that Option B guide the Ministry in its development of policy directed at improving educational software standards for British Columbia.

RECOMMENDATIONS ON SOFTWARE STANDARDS:

Recommendation 7

"That the Ministry expand its current software evaluation service to ensure that the schools of British Columbia are provided with a high standard of educational software."

Comment: The service presently being provided by PEMC contains the basis for the recommended expansion. However, a substantial extension of this service would be required to achieve the suggested outcome.

Recommendation 8

"That the present PEMC evaluation criteria form the basis for the creation of specific software standards that would provide for evaluations of: educational content, congruence with the British Columbia school curriculum, instructional methodology, social context, and achievement criteria."

Comment: Current use of computers in the classrooms of British Columbia, with the exception of Computer Studies 11 and Computer Science 12, is extra to the requirements of the curriculum. It is now essential that the classroom use of computers should be "added-in" to the curriculum, as opposed to being "added-on" to it. The proposed standards are necessary to ensure that appropriate software is selected.

Recommendation 9

"That the results of software evaluations be made readily available to teachers and administrators throughout the province."

Comment: Because improved software is constantly entering the market, it is important that the latest information be disseminated as quickly as possible.

Recommendation 10

"That the Ministry extend its cooperation with other educational jurisdictions on the creation of improved criteria and standards for software evaluation."

Comment: The software development industry has indicated its eagerness to respond to the stated needs of education. The combined efforts of two or more jurisdictions will have greater impact in shaping future software development than those of a single province.

Recommendation 11

"That the Ministry seek opportunities to enter into joint ventures with other educational jurisdictions for the purposes of designing and developing exemplary software."

Comment: While the province of British Columbia comprises a substantial market for educational software, there would be considerable benefit in entering into joint ventures with other jurisdictions. Such cooperation would permit both the design and the development of commonly-used software, within the guidelines of a comprehensive set of standards. It seems reasonable to suggest that there would also be associated cost advantages.

TERM OF REFERENCE D

"Study the potential of site-licensing commercial software, and the possibility of marketing B.C.-developed software."

OUTCOME:

"Recommend licensing options."

BACKGROUND:

Most software, currently, is purchased by schools from local suppliers, or directly from developers and publishers. These individual purchases, however, do not benefit from the cost savings that would result from the combined purchasing power of several Districts, or from arrangements made by the Ministry on behalf of all Districts. There are at least three ways in which the Ministry could assist in reducing the cost of software.

The first of these is to negotiate "site licenses" with suppliers of frequently-used software. For a flat fee, the Ministry buys the rights to specific software which can then be used on an unlimited basis throughout the Province. As an example, software produced by the Minnesota Educational Computing Consortium (MECC) is available from the Provincial Educational Media Centre (PEMC) under the terms of a site license that was first negotiated in 1980. This arrangement has provided the schools of the Province with useful software at a reasonable cost.

"Bulk purchasing" agreements provide an alternative method of reducing the costs of software. The Ministry can enter into a contract with a software supplier to purchase a specified quantity of a given product. Because of the high volume, the negotiated price would be well below that which a school, or even a District, could expect to pay.

A useful variant of bulk purchase agreements is the "supply contract" in which a supplier agrees to provide a product for a stated price to any person or agency that is covered within the contract. Thus, teachers, schools, or Districts can purchase directly from the supplier at the agreed price. The PEMC has used supply contracts, very successfully, in arranging a supply contract for low-cost blank diskettes for the schools of British Columbia.

Because most of the software used in the schools comes from suppliers with whom no site license or bulk purchase agreement has

been negotiated, supplying a computer laboratory of 15 stations with a software package priced at $200 will cost the school $3,000. Since few schools can afford to buy many packages at these prices, teachers have been placed in the ambiguous position of either copying software or going without a useful program. Those who choose to go without may be denying their students important learning experiences. Those who choose to copy could be breaking the law. The implications of this are obvious, and site licensing or bulk purchasing appear to offer the most reasonable solutions.

The Committee was informed that most of the educational software available at this time is either inadequate, or too expensive, or both. There was a strong plea for Ministry intervention so that the quality of software might increase and the costs be reduced. This would involve site licensing or bulk purchasing those software packages that are found to be of sufficient quality and utility for general use. It might also require contracted development if quality software is not available at reasonable cost from the existing supply.

POLICY OPTIONS:

Option A:

Districts and schools should continue to purchase educational software according to their own requirements and means.

Option B:

The Ministry should assist schools and Districts by negotiating site licenses or bulk purchases for frequently-used educational software. Where such arrangements cannot be made, or where a specific deficiency in the supply of software is identified, the Ministry should contract with software developers to meet the requirements.

Preferred Option:

The Committee suggests that **Option B** guide the Ministry in establishing policy on site licensing, bulk purchasing, and the acquisition of contracted software.

RECOMMENDATIONS ON SITE LICENSING:

Recommendation 12

"That the Ministry review the educational software requirements of the Province, and where indicated by a potentially high frequency of use, negotiate provincial site licenses or bulk purchasing agreements with the suppliers of the software."

Comment: The Ministry will not hold an exclusive right to negotiate site licenses and bulk purchases. Districts and schools may find it useful to enter into supply agreements of either type.

Recommendation 13

"That where satisfactory site licenses or bulk purchasing agreements for frequently-used educational software cannot be negotiated, or where a useful software package is not commercially available, the Ministry contract with software developers, giving preference to those in British Columbia, to provide the required software."

Comment: The software development industry in British Columbia has a growing reputation for the quality of its products. There is evidence that funds spent on software development provide very substantial benefits to the local economy.

Recommendation 14

"That where the Ministry assumes the total cost of the development of a software package it should retain full copyright, and arrange for marketing of the product beyond British Columbia."

Comment: For software development contracts in which the Ministry assumes only part of the cost of development, ownership of copyright and marketing rights would be negotiable.

TERM OF REFERENCE E

"Examine the capabilities of various hardware configurations."

OUTCOME:

"Recommend computer hardware standards that will support good instructional software."

BACKGROUND:

In the Pilot Project of 1980-82, the choice of the Apple II Plus was based primarily on the fact that a considerable amount of software was available for that microcomputer. Many schools throughout the Province followed this lead and purchased similar equipment. A province-wide survey, carried out by the Ministry in the spring of 1986, indicated that approximately 65% of the microcomputers in the schools of British Columbia were Apples, or Apple compatibles. Commodores comprised about 26%, while IBM PCs and PC compatibles were at 5%. The remaining 4% were from various manufacturers including, Acorn, Tandy and Coleco. There were approximately 11,700 microcomputers in schools at that time.

Except for the Pilot Project, there has been no indication from the Ministry of any preferred models of microcomputer. As a result, Districts have purchased computers according to their own judgements. Most of the costs of hardware, software, and support mechanisms have been assumed by the Districts. However, a very large proportion of the hardware was purchased with funds raised by parent and teacher efforts. In travelling through the Province, members of the Committee observed that most of these computer facilities were achieving their intended objectives, but that there was great disparity in the extent to which the schools of various Districts were equipped. There were many requests from teachers and administrators for Ministry policies that would assist in bringing about equity of student access.

The matter of purchasing hardware has been made even more complicated by recent increases in the capacity and performance of microcomputers, together with relative decreases in their cost. This has raised questions as to the "best" model to purchase for present and future applications. Also, the Funds For Excellence program seems to have encouraged more active sales efforts by computer vendors. As a result, many districts have expressed concern about having to make purchasing decisions without the benefit of external guidelines.

It is generally acknowledged that the decision to purchase microcomputers for educational purposes should follow a thorough review of the specific applications to be used in the school, and the identification of the software available to support those applications. The decision of which computer to buy would, therefore, be based upon its ability to support the specified applications. It is evident that no single computer can totally satisfy the current range of applications from kindergarten through grade 12.

There are several technical factors to be considered in the selection of computer hardware. Foremost among these is the specific operating system (OS) within which the computer performs its tasks. This is important because it essentially determines the software that can be used, and therefore imposes limits on the range of classroom applications. There are currently three operating systems which dominate the microcomputer market: Apple II, Apple Macintosh, and IBM PC-DOS (and MS-DOS). A fourth, Unix (or Unix-like OS) as used by the AT&T and Icon systems, is already established as an important minicomputer operating system, and has the potential for becoming such with microcomputers. Virtually all computer manufacturers produce machines that can use at least one of these operating systems.

In general, most microcomputers on the market are capable of providing teachers with reasonably reliable performance, and reliability has steadily improved to the point where it is seldom a factor in the selection process. Of real concern, however, are such matters as the quality and cost of maintenance and support provided by the computer supplier. The period of the initial warranty and the cost of extending it is also important in the selection decision. Training for teachers, administrators, and technicians is provided by some vendors, but not by others.

Further considerations in selecting a computer include the vendor's policies on upgrading equipment that has been made obsolete by the introduction of new and better models, and the compatibility of previously-purchased software with the new computer systems. It is estimated that the useful life of a microcomputer is between three and five years. Since good software often remains useful for a longer period, it is important that it be able to run on the new system, otherwise the real cost of the new system must include the purchase of new software.

A matter that is complicating the purchase of microcomputers is the legal position of "compatibles" and, more particularly, "clones." A compatible will accommodate 90% to 95% of the software that was designed to run on a microcomputer produced by one of the major manufacturers such as Apple or IBM. A clone is capable of running virtually all of the software that runs on its counterpart. The essential difference between compatibles and clones is the existence of a special proprietary microchip installed in the clone that enables it to run copyrighted software. Recently, the Apple Computer Company obtained an

injunction in the Federal Court of Canada, against the sale of certain "Apple clones" containing a microchip that was developed and copyrighted by Apple. Although this judgement is now being appealed to the Supreme Court of Canada, it currently serves to warn school districts that the sale of Apple clones is contrary to law. Hence, even though substantial savings in the cost of "equivalent" hardware is possible through the purchase of Apple clones, it would seem unwise for a district to consider such purchases until the legal implications of doing so are made clear. A similar suit, directed at IBM PC clones, is underway at this time.

It seems timely that the Ministry establish policies and standards to assist in the selection of computer hardware. Because the capacity of hardware is changing continuously, the standards should be capable of adapting to these changes.

POLICY OPTIONS:

Option A:

The Ministry should maintain the status quo, whereby each District carries total responsibility for the selection of computing equipment according to its own specifications.

Option B:

The Ministry should recommend a single microcomputer system, judged capable of supporting the majority of educational applications, for use in the schools of British Columbia.

Option C:

The Ministry should recommend two or three microcomputer systems, based on their relative capabilities, for use in the schools of British Columbia.

Option D:

The Ministry should set appropriate standards, or guidelines, for the purchase of computing equipment that will support the full range of classroom applications. Any software support provided by the Ministry would be limited to three or four operating systems. The Ministry would provide the Districts with a decision-making model to assist in the selection process. The standards would be reviewed annually, by the Ministry, to ensure they are concurrent with developments in the computer industry.

PREFERRED OPTION:

The Committee suggests that Option D guide the Ministry in its development of policy directed at establishing standards for the purchase of computer hardware for the schools of British Columbia.

RECOMMENDATIONS ON HARDWARE STANDARDS:

Recommendation 15

"That the Ministry adopt the following standards as guidelines for the acquisition of computing hardware, and that the standards be reviewed annually."

The recommended minimum hardware standards should be:

1. Microcomputers that have the capability of using, without restriction, one or more of, Apple // ProDOS, Apple Macintosh OS, IBM PC-DOS/MS-DOS, or UNIX
2. Random Access Memory of 256 Kilobytes
3. Color graphics support capable of 80-column resolution
4. Two disk drives
5. Two available peripheral expansion slots, and two small computer systems interface connectors
6. One serial and one parallel interface unit
7. Capability of connecting to a local area network
8. An initial one-year comprehensive warranty, with extendable coverage to a total of five years
9. Assurance of compatibility of current software with each introduction of a more advanced model
10. Assurance that current equipment can be upgraded at reasonable cost with each introduction of a more advanced model.

Comment: These standards are intended to provide the framework within which Districts can purchase appropriate computing hardware for general classroom and laboratory use. For special applications, such as computer aided drafting, keyboard skill development, and education of the handicapped, it may be necessary to depart from them.

Recommendation 16

"That School Districts apply the Ministry's standards to all future purchases of computing equipment."

Comment: Most Districts have demonstrated the ability to select and use computers effectively in their schools. The standards suggested here should ensure that appropriate decisions will continue to be made within the context of province-wide guidelines.

TERM OF REFERENCE F

"Examine the process of integrating the computer into the curriculum."

OUTCOME:

"Recommend a curriculum integration procedure for the Ministry."

BACKGROUND:

When the computer itself is the object of study, as it has been in computer science courses for the past 15 to 20 years, the computer curriculum stands essentially on its own. However, now that the computer is being used as both a tutor and a tool in various subject areas, the need for integration with the curriculum is essential if the potential benefits are to be realized.

In visiting Districts throughout the Province, members of the Committee were in many classrooms where computers were being used effectively. These teachers, through their own initiative and often with the assistance of a District coordinator, seemed to have successfully provided the necessary integration. For the most part, however, teachers and administrators have asked for more direction from the Ministry on appropriate ways of merging computers into the instructional process.

What is required is a careful examination of all curricula to determine those components which have the potential for enhancement by computer applications. Those that are identified should be revised to include specifications for appropriate computer-based experiences. The effective use of computers depends upon their importance to the attainment of specific curriculum objectives.

The rate at which hardware and software improvements are taking place suggests that the traditional curriculum revision cycle is too slow. It seems necessary, therefore, to undertake an overall review and to make initial adjustments as soon as possible. Then, each curriculum area should be reviewed every three to five years to ensure that technology is being applied effectively.

POLICY OPTIONS:

Option A:

Districts should continue to provide for the integration of computers into the school curriculum.

Option B:

The Ministry should specify classroom applications and the software required to support them.

Option C:

The Ministry should establish the principles and priorities through which computers can be integrated into the school curriculum, and encourage the Districts to use them to guide their planning and implementation.

Preferred Option:

The Committee suggests that Option C guide the Ministry in its development of policy directed toward the integration of computer applications into the school curriculum.

RECOMMENDATIONS ON INTEGRATING COMPUTERS INTO THE CURRICULUM:

Recommendation 17

"That the Ministry review the entire school curriculum, as soon as possible, to determine those areas which would benefit from the inclusion of computer applications, and then develop strategies for their integration."

Comment: The task of integrating computer applications into the school curriculum is critical to achieving the anticipated benefits. The review and development process should be accelerated. The priorities listed in Recommendation 5 should guide the curriculum integration process.

Recommendation 18

"That the Ministry expand its current curriculum revision process to include considerations of computer applications."

Comment: The ongoing revision of individual curricula has not, to date, considered the role of the computer. The list of priorities in Recommendation 5, should guide the review process. The application of computers in the classroom should be essentially determined by the needs of the curriculum.

Recommendation 19

"That all curriculum revision committees contain at least one member with expertise in computer applications."

Comment: This will ensure that each revision committee is supported in its efforts to integrate computers into the curriculum.

Recommendation 20

"That the curriculum revision process be accelerated to accommodate the rapid changes in the technology."

Comment: The traditional nine-year cycle for the review of curricula is incapable of dealing with the rate at which computer technology is evolving. A maximum cycle of three to five years would seem to be required.

TERM OF REFERENCE G

"Examine the need for teacher inservice and training."

OUTCOME:

"Recommend a provincial teacher inservice plan and guidelines for preservice in educational computer technology."

BACKGROUND:

When the microcomputer arrived, many teachers became converts to the computer revolution - they purchased computers for themselves and carried them to school to share their enthusiasm with their students and their colleagues. These pioneers have led the field of education, often with little initial support, into the revolution. They virtually trained themselves to use computers, and then set out as evangelists to show what their wonderful machines could do. They enlisted the assistance of administrators and parent-teacher groups to provide them with more and better equipment, and gave of their own time and effort to demonstrate their belief in the importance of using computers in the schools.

There are teachers, however, who have not developed the same enthusiasm for computers. They tend to be skeptical of what is happening, and view it as a fad that will almost certainly pass, as have so many other educational innovations, and they are going to require solid evidence to the contrary before they will become active participants. Moreover, many teachers feel they already have more to do than they can manage, and the added burden of acquiring the skills necessary to use computers effectively is something they do not need at this time. As a result, a large proportion of the teaching force lacks the ability to use computers confidently and effectively. However, the Committee found that, under appropriate circumstances, most teachers would be willing to learn how to use computers. This means that a substantial inservice effort will be required if the investment in computer hardware and software is to be justified.

It was suggested to the Committee that a systematic approach to the provision of inservice training is needed. Inservice models should be developed, and resource materials produced. Each District should have a person designated to organize inservice programs. Each school should designate one or more computer resource persons to support the program at the school level, at least during the early implementation period.

It was suggested that a minimum of three to five days per year of teacher inservice is required. Initially, it may be necessary to organize workshops during the summer and on weekends to ensure that sufficient time is available. There may be financial recognition for the participants when they are giving of their own time in this way. Some Districts have already used this approach with considerable success. Adequate funding is obviously critical to the success of the inservice program.

It is essential that teachers have regular access to computing equipment as they develop their skills. Computers should be made available for teacher use in the staff room, or in a special computer resource room. It should be possible for teachers to have evening and weekend access to equipment. It may also be possible to arrange discounts for teachers who wish to purchase their own equipment.

The assistance of all agencies capable of providing inservice training is essential. In addition to local resource persons, the Faculties of Education, the Colleges, and the Open Learning Authority should be encouraged to increase their involvement to help meet the demand.

With regard to the preservice education of teachers, it is recognized that the three Faculties of Education have offered credit courses in computer applications for several years. These courses have been optional components of undergraduate programs. It is evident that future graduates must have the skills that will enable them to use computers effectively in their classrooms.

POLICY OPTIONS ON TEACHER INSERVICE:

Option A:

Districts should carry the responsibility for providing inservice training on computer applications to teachers.

Option B:

The Ministry should assume the total responsibility for teacher inservice including planning, organization, and delivery.

Option C:

Teacher inservice should be viewed as a responsibility to be shared by the teacher, the District, and the Ministry.

Preferred Option:

The Committee suggests that Option C guide the Ministry in its development of policy directed at the provision of inservice training to teachers.

RECOMMENDATIONS ON TEACHER INSERVICE:

Recommendation 21

"That the Ministry develop and publish models for the delivery of teacher inservice on the use of computers in the classroom."

Comment: The Committee observed several successful inservice models during its visits to Districts. These models should be collected and distributed.

Recommendation 22

"That the Ministry provide inservice training for teachers when specific computer applications are required by revisions to the Provincial school curriculum."

Comment: It is probable that future revisions to provincial curricula will include specifications for computer applications. It will be important to ensure that all teachers affected by the changes are provided with the opportunity to acquire the necessary skills.

Recommendation 23

"That the Districts provide inservice training for teachers when specific computer applications are required by the District."

Comment: Districts should provide their teachers with the additional skills they require to accommodate locally-determined priorities.

Recommendation 24

"That the Faculties of Education, the Colleges, the Open Learning Authority, and other training organizations be encouraged to increase their efforts in providing inservice training to teachers."

Comment: The amount of inservice training needed will require the cooperation of all who are able to provide it.

Recommendation 25

"That Districts be encouraged to establish policies through which teachers will have access to computers, either at school or at home, for the purposes of improving teacher skills in using computers."

Comment: The amount of time required for teachers to become proficient in their use of computers is substantial. Accessibility to computers is critical to the development of teacher skills.

Recommendation 26

"That the Ministry encourage Districts to organize special inservice programs on computer applications for school administrators."

Comment: The evidence is very clear that the knowledge, interests, and attitudes of school administrators are crucial to the implementation of innovation.

POLICY OPTIONS ON TEACHER PRESERVICE:

Option A:

The Ministry should require that one or more formal courses in educational computer applications be taken by undergraduate students prior to their certification as teachers.

Option B:

The Ministry should expect that all student teachers will have the opportunity to learn through, with, and about computers, and be able to use computers in the school classroom.

Preferred Option:

The Committee suggests that **Option B** guide the Ministry in its development of policy directed toward the Faculties of Education for the provision of preservice training to teachers.

RECOMMENDATIONS ON TEACHER PRESERVICE:

Recommendation 27

"That the Ministry expect the Faculties of Education to provide student teachers with opportunities that will teach them how to use computers and how computers can be used effectively in the school curriculum."

Comment: It is critical that beginning teachers be able to use computers from the first day in their own classrooms.

Recommendation 28

"That the Ministry encourage the Faculties of Education to carry out research into new and effective ways of integrating computer technology into the curriculum."

Comment: The universities have an important role to play in guiding the development and use of this educational innovation.

TERM OF REFERENCE H

"Explore the communication requirements necessary to ensure effective utilization of computer technology."

OUTCOME:

"Recommend a mechanism to establish effective communication channels."

BACKGROUND:

The world is rapidly becoming a "global village." It is possible, for example, for a pupil in British Columbia to participate in a computer conference with others throughout the world. The same pupil can also access one of the many public databases, in such places as Toronto, San Francisco or New York, to obtain information on virtually any topic. Many teachers are already providing their pupils with these opportunities by connecting microcomputers to regular telephone lines.

We are entering the "Information Age" in which access to information will be of much greater importance than ever before. The computer revolution is the force that is driving us in this direction. Business, industry and government depend heavily on computer networks to communicate the information necessary to keep them in operation.

While the benefits of computer networks in the business environment are well established, it is not clear at this time whether the benefits of computer networks outweigh the costs. Several Districts in the Province have already networked their schools. These Districts should be able to provide information on the usefulness of their local networks.

Members of the Committee received many requests for better access to information on a variety of topics. An obvious solution would be a province-wide educational network which would also allow national and international connections. Such a network could be used for a variety of purposes. For example, software could be distributed directly to teachers over the network. In addition, student records could be transferred, administrative and curriculum notices could be distributed, and teachers and students could have access to a variety of databases. Electronic mail could be used to facilitate communications among all users of the network, which could include international student communications.

POLICY OPTIONS:

Option A:

The Ministry should continue the current policy of using public network access to School Districts. The Ministry should encourage the expansion of access to a public network service to include all schools in the Province.

Option B:

The Ministry should develop a province-wide computer network that would link all schools, Districts, and the Ministry. Access to a variety of database services would be provided. The Ministry would establish the technical specifications for the network, and would be responsible for links among the Districts and the Ministry. The Districts would be responsible for links among schools and the District offices.

Option C:

The Ministry should undertake a broad-based study of the benefits of using computer communications networks and database access. Districts should be guided in their development of networks linking schools with District offices.

Preferred Option:

The Committee suggests that Option C provide the basis for the immediate and short-term development of policy on computer-based communications, and that Option B be adopted as the longer-term policy objective if the studies demonstrate benefits in relation to costs.

RECOMMENDATIONS ON COMMUNICATIONS:

Recommendation 29

"That the Ministry provide leadership by establishing the technical specifications for computer communications networks, and by evaluating the benefits of computer communications networks in relation to their costs."

Comment: There is a great variety of networking systems available. Guidelines are necessary to ensure interconnections among the systems being used. However, it is not clear at this time whether the benefits of using networks outweigh their costs, therefore it would be important to have this information available for planning purposes.

Recommendation 30

"That the Ministry negotiate the bulk purchase of database services from public network utilities."

Comment: The costs of accessing public databases can be very high. There would be substantial savings if the Ministry were to arrange for province-wide school access to one or more of these systems.

Recommendation 31

"That the Ministry encourage Districts to evaluate the potential benefits of computer communications networks, and where found to be advantageous, encourage the establishment of District networks."

Comment: Some Districts may gain more than others from the use of an intra-district computer network. Each District should determine whether it can benefit from such a network and act accordingly.

Recommendation 32

"That, if the results of the recommended evaluations demonstrate the utility of computer communications networks, the Ministry should initiate the development of a province-wide Educational Computer Network."

Comment: A network linking the schools, Districts, and the Ministry would accommodate, in addition to electronic mail and database access, the delivery and exchange of software, instructional materials, achievement test items, and student records. When this range of uses is considered, the benefits may well justify the costs.

TERM OF REFERENCE I

"Determine an implementation strategy and a plan for the integration of computers into the instructional program."

OUTCOME:

"Recommend a timetable, priorities, and a phase-in plan."

Recommendation 33

THE IMPLEMENTATION PLAN

The Committee recommends the following for the initial five years (September 1, 1987 - June 30, 1992) of a rolling five-year plan. The outcomes of year one should be reviewed, and appropriate adjustments made to years two through five. Year six would then be included in the projection.

The dollar amounts indicated are the best estimates that can be made at this time. They should be viewed as tentative, pending feedback from the review and validation of this Interim Report. The average annual cost is estimated at $25 million, which is approximately $54 per pupil per year, and a total of $125 million for the five-year period. This expenditure is equivalent to an average of $30 per year from each household in the Province. Under current funding arrangements, the average cost would be about $7.50 per household per year.

While not readily quantifiable in the short term, financial investment in the educational use of computers will have a positive impact on the provincial and local economies. Value added to the hardware purchases, stimulation of the provincial software industry, growth in maintenance and support services, and expansion of the professional inservice force will create jobs and bring a financial return to the local and provincial governments. In the long term, however, the most significant return on the investment will be the graduating students, skilled in the use of computers and information, who will enhance the Province's economic future.

33.1 TEACHER INSERVICE ($3.2 million/year)

Five days of inservice training should be provided for one-fifth (approximately 5,000 teachers) of the entire teaching force in each of the five years.

The Ministry should encourage Districts to establish policies whereby teachers will have access to microcomputers out of teaching time at school, and at home during evenings and weekends.

The Ministry should encourage hardware vendors to sell microcomputers at the lowest cost possible to teachers who wish to purchase systems for themselves. The possibility of income tax deductions for teachers purchasing educational computers should be explored.

The Ministry should request the assistance of the Faculties of Education, the Colleges, the Open Learning Authority, the Teachers' Federation, and other suppliers of inservice training.

33.2 SOFTWARE ($3.0 million/year)

The Ministry should immediately assist Districts in ensuring the legality of all educational software currently being used in the Province's schools.

The Ministry should establish review procedures to identify appropriate links between the existing school curriculum and currently-available computer applications. The findings of the review should be incorporated into the school curriculum as quickly as possible.

The Ministry should identify the most frequently-used software packages, and then negotiate site licenses, bulk purchases, or software development contracts to ensure that software is available to schools at minimum cost.

The Ministry should increase the flow of information to teachers about the availability of appropriate classroom applications of software.

The Ministry should expand the functions of the Provincial Educational Media Centre to include the acquisition, evaluation, and distribution of educational software.

33.3 HARDWARE ($12 million/year)

There should be the overall objective of purchasing an average of 6,000 microcomputer systems per year for the five-year period, 1987 - 1992. The average cost for a computer workstation is estimated at $2,000. The total acquisition of 30,000 computers would provide a ratio of one computer for every 16 students. The

combination of the new purchases and those already in the schools, would result in a ratio of approximately one computer for every 12 students. This compares to proposals for a 1:8 ratio by 1985 in the Province of Alberta, and for a 1:7 ratio by 1990 in the Ottawa Board of Education.

At the completion of the five-year period:

1. Each medium to large senior secondary school in the Province should have at least three microcomputer laboratories, each with a minimum of 15 workstations. Additional computers for classroom applications should be provided on the basis of demonstrated need. Smaller senior secondary schools should have facilities scaled to their specific requirements.

2. Each medium to large junior secondary school in the Province should have at least two microcomputer laboratories, each with a minimum of 15 workstations. Additional computers for classroom applications should be provided on the basis of demonstrated need. Smaller junior secondary schools should have facilities scaled to their specific requirements.

3. Each elementary school in the Province should have a minimum of one microcomputer system per classroom. These may be dispersed through the school in appropriately-designed classroom locations, or in a dedicated laboratory. It will be necessary to increase this ratio for small elementary schools to ensure an adequate minimum number of computers.

4. All documented requirements for computing equipment for special education and learning assistance purposes should be satisfied.

5. Each school library in the Province should have a microcomputer system connected to a modem for networking and database access.

6. The upgrading of obsolete and unreliable computing equipment should be an ongoing process.

33.4 COORDINATION AND MAINTENANCE ($3 million/year)

Coordination of District computer activities is essential, and may be provided by a single person (either full or part time) or by a coordinating committee. A formal training program for District computer coordinators should be developed and administered by the Ministry.

Depending on the size of the school, one or more school-based computer resource persons should be identified for each school in the Province. The role of the computer resource person should be defined by the District. A formal training program for school

resource persons should be developed by the Ministry and administered by the Districts. The training of school resource persons should be provided by the District in sequence with the installation of new computers into the schools.

Computer technicians for each District should be identified and provided with the training necessary for limited maintenance services.

33.5 PHYSICAL PLANT ($2.8 million/year)

The Ministry should immediately undertake a comprehensive survey of the alterations to buildings that will be necessary to provide for the recommendations of this Report.

Specific standards should be established for each area of the school where computers may be operated, including classrooms, laboratories, and special education rooms. These standards should include specifications for: space, lighting, climate control, health and safety, furniture (ergonomics), electrical supply, access, and security. Each District should then develop a formal plan for the required upgrading of its physical plant, and submit the plan to the Ministry for approval and funding. These standards would be applied to all new school construction.

33.6 COMMUNICATIONS ($500,000/year for two years)

Public network access should be expanded to include all Districts.

Each District, where appropriate, should establish a computer communications network linking all of its schools, within Ministry guidelines.

Because the benefits of a Provincial network are difficult to quantify in relation to the costs, the Ministry should undertake studies, and support pilot projects directed toward assessing network operations and database applications. A decision to proceed to a full network would be based on the results of the pilots.

33.7 CURRICULUM DEVELOPMENT AND INTEGRATION ($200,000/year)

The Ministry should direct the Curriculum Development Branch to undertake the steps necessary to support the integration of computer applications into the school curriculum.

33.8 RESEARCH & DEVELOPMENT, AND EVALUATION ($600,000/year)

The Ministry should establish an educational technology centre with responsibility for acquiring and disseminating information, software evaluation, contracting for research and development activities in support of computer applications, and evaluating the progress of all programs and activities recommended in this Report. This office should be commissioned to function as a central information centre. It should regularly provide teachers with a broad range of information on educational computer applications.

PROVINCIAL ADVISORY COMMITTEE ON COMPUTERS

QUESTIONNAIRE ON POLICY OPTIONS AND RECOMMENDATIONS

Instructions:

1. Please detach and re-staple the pages of the Questionnaire.
2. Indicate your opinion with an "X" in the appropriate box.
3. If you wish to add comments, please do so.
4. Mail the completed questionnaire to:

PACC
Information Services
Ministry of Education
Parliament Buildings
Victoria, B.C.
V8V 2M4

I am a: Pupil [] 1 Teacher [] 2 School Administrator [] 3

District Administrator [] 4 Trustee [] 5

School Parent [] 6 Member of General Public [] 7

TERM OF REFERENCE A

"Determine the Ministry's involvement in the area of instructional use of computers."

POLICY GUIDE:

The Ministry should provide leadership and organization for the orderly development of computer applications in the schools. It should undertake a review of the entire school curriculum and within it identify, and recommend for use in the schools, those computer applications that have the potential for improving student learning. The Ministry should arrange for the necessary funding to carry out the recommendations contained in this Report.

Agree [] Disagree [] No Opinion [] 2

Comment: _____

_____

Recommendation 1

"That the Ministry of Education place a high priority on carrying out the recommendations of this Report."

Agree [] Disagree [] No Opinion [] 3

Comment: _____

_____

Recommendation 2

"That the Ministry undertake a rolling five-year plan for the development and support of computer applications in the schools, and that this plan be reviewed and adjusted annually to accommodate changes in the technology."

Agree [] Disagree [] No Opinion [] 4

Comment: _____

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Recommendation 3

"That the Ministry continue to apply the principles of equalized funding in providing for the costs associated with the development of computer applications in the schools."

Agree [] Disagree [] No Opinion [] 5

Comment: _____

_____

TERM OF REFERENCE B

"Determine how the computer can support and enhance a student's education in a more effective manner."

POLICY GUIDE:

The Ministry should establish the broad priorities and principles under which the application of computers in the schools should be carried out, and encourage the Districts to use them to guide their planning and implementation.

Agree [] Disagree [] No Opinion [] 6

Comment: _____

_____

Recommendation 4

"That by 1992, all pupils in the schools of British Columbia will have appropriate opportunities for learning through, with, and about computers."

Agree [] Disagree [] No Opinion [] 7

Comment: _____

_____

Recommendation 5

"That the Ministry adopt the following priorities in providing appropriate opportunities for learning through, with, and about computers. These priorities should be reviewed annually." (see page 7)

Agree [] Disagree [] No Opinion [] 8

Comment: _____

_____

Recommendation 6

"That separate computing facilities be provided for teacher oriented applications such as classroom management and the preparation of instructional materials."

Agree [] Disagree [] No Opinion [] 9

Comment: _____

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TERM OF REFERENCE C

"Examine the software standards that have been set nationally and internationally."

POLICY GUIDE:

The Ministry should establish more rigorous evaluation criteria and apply them to selected software appropriate to the curriculum. Teachers would be provided with a list of "Ministry-approved and recommended" educational software. "Supplementary" software would continue to be evaluated under the current system of field trials by one or more teachers. The information generated by these enhanced evaluation procedures would be made available, as quickly as possible, to teachers and administrators. Cooperation with other educational jurisdictions on the development of exemplary software, based on better software standards, should be actively pursued.

Agree [] Disagree [] No Opinion [] 10

Comment: _____

_____

Recommendation 7

"That the Ministry expand its current software evaluation service to ensure that the schools of British Columbia are provided with a high standard of educational software."

Agree [] Disagree [] No Opinion [] 11

Comment: _____

_____

Recommendation 8

"That the present PEMC evaluation criteria form the basis for the creation of specific software standards that would include ratings for: educational content, correspondence with the British Columbia school curriculum, instructional methodology, social context, and achievement criteria."

Agree [] Disagree [] No Opinion [] 12

Comment: _____

_____

Recommendation 9

"That the results of software evaluations be made readily available to teachers and administrators throughout the province."

Agree [] Disagree [] No Opinion [] 13

Comment: _____

_____

Recommendation 10

"That the Ministry extend its cooperation with other educational jurisdictions on the creation of improved criteria and standards for software evaluation."

Agree [] Disagree [] No Opinion [] 14

Comment: _____

_____

Recommendation 11

"That the Ministry seek opportunities to enter into joint ventures with other educational jurisdictions for the purposes of designing and developing exemplary software."

Agree [] Disagree [] No Opinion [] 15

Comment: _____

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TERM OF REFERENCE D

"Study the potential of site-licensing commercial software, and the possibility of marketing B.C.-developed software."

POLICY GUIDE:

The Ministry should assist schools and Districts by negotiating site licenses or bulk purchases for frequently-used educational software. Where such arrangements cannot be made, or where a specific deficiency in the supply of software is identified, the Ministry should contract with software developers to meet the requirements.

Agree [] Disagree [] No Opinion [] 16

Comment: _____

_____

Recommendation 12

"That the Ministry review the educational software requirements of the Province, and where indicated by a potentially high frequency of use, negotiate provincial site licenses or bulk purchasing agreements with the suppliers of the software."

Agree [] Disagree [] No Opinion [] 17

Comment: _____

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Recommendation 13

"That where satisfactory site licenses or bulk purchasing agreements for frequently-used educational software cannot be negotiated, or where a useful software package is not commercially available, the Ministry contract with software developers, giving preference to those in British Columbia, to provide the required software."

Agree [] Disagree [] No Opinion [] 18

Comment: _____

_____

Recommendation 14

"That where the Ministry assumes the total cost of the development of a software package it should retain full copyright, and arrange for marketing of the product beyond British Columbia."

Agree [] Disagree [] No Opinion [] 19

Comment: _____

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TERM OF REFERENCE E

"Examine the capabilities of various hardware configurations."

POLICY GUIDE:

The Ministry should set appropriate standards, or guidelines, for the purchase of computing equipment that will support the full range of classroom applications. Any software support provided by the Ministry would be limited to three or four operating systems. The Ministry would provide the Districts with a decision-making model to assist in the selection process. The standards would be reviewed annually, by the Ministry, to ensure they are concurrent with developments in the computer industry.

Agree [] Disagree [] No Opinion [] 20

Comment: _____

_____

Recommendation 15

"That the Ministry adopt the following standards as guidelines for the acquisition of computing hardware, and that the standards be reviewed annually."

The recommended minimum hardware standards should be:

1. Microcomputers that have the capability of using, without restriction, one or more of, Apple // ProDOS, Apple MacIntosh OS, IBM PC-DOS/MS-DOS, or UNIX
2. Random Access Memory of 256 Kilobytes
3. Color graphics support capable of 80-column resolution
4. Two disk drives
5. Two available peripheral expansion slots, and two small computer systems interface connectors
6. One serial and one parallel interface unit
7. Capability of connecting to a local area network
8. An initial one-year comprehensive warranty, with extendable coverage to a total of five years
9. Assurance of compatibility of current software with each introduction of a more advanced model
10. Assurance that current equipment can be upgraded at reasonable cost with each introduction of a more advanced model.

Agree [] Disagree [] No Opinion [] 21

Comment: _____

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Recommendation 16

"That School Districts apply the Ministry's standards to all future purchases of computing equipment."

Agree [] Disagree [] No Opinion [] 22

Comment: _____

_____

TERM OF REFERENCE F

"Examine the process of integrating the computer into the curriculum."

POLICY GUIDE:

The Ministry should establish the principles and priorities through which computers can be integrated into the school curriculum, and encourage the Districts to use them to guide their planning and implementation.

Agree [] Disagree [] No Opinion [] 23

Comment: _____

_____

Recommendation 17

"That the Ministry review the entire school curriculum, as soon as possible, to determine those areas which would benefit from the inclusion of computer applications, and then develop strategies for their integration."

Agree [] Disagree [] No Opinion [] 24

Comment: _____

_____

Recommendation 18

"That the Ministry expand its current curriculum revision process to include considerations of computer applications."

Agree [] Disagree [] No Opinion [] 25

Comment: _____

_____

Recommendation 19

"That all curriculum revision committees contain at least one member with expertise in computer applications."

Agree [] Disagree [] No Opinion [] 26

Comment: _____

_____

Recommendation 20

"That the curriculum revision process be accelerated to accommodate the rapid changes in the technology."

Agree [] Disagree [] No Opinion [] 27

Comment: _____

_____

TERM OF REFERENCE G

"Examine the need for teacher inservice and training."

POLICY GUIDE FOR INSERVICE:

Teacher inservice should be viewed as a responsibility to be shared by the teacher, the District, and the Ministry.

Agree [] Disagree [] No Opinion [] 28

Comment: _____

_____

Recommendation 21

"That the Ministry develop and publish models for the delivery of teacher inservice on the use of computers in the classroom."

Agree [] Disagree [] No Opinion [] 29

Comment: _____

_____

Recommendation 22

"That the Ministry provide inservice training for teachers when specific computer applications are required by revisions to the Provincial school curriculum."

Agree [] Disagree [] No Opinion [] 30

Comment: _____

_____

Recommendation 23

"That the Districts provide inservice training for teachers when specific computer applications are required by the District."

Agree [] Disagree [] No Opinion [] 31

Comment: _____

_____

Recommendation 24

"That the Faculties of Education, the Colleges, the Open Learning Authority, and other training organizations be encouraged to increase their efforts in providing inservice training to teachers."

Agree [] Disagree [] No Opinion [] 32

Comment: _____

_____

Recommendation 25

"That Districts be encouraged to establish policies through which teachers will have access to computers, either at school or at home, for the purposes of improving teacher skills in using computers."

Agree [] Disagree [] No Opinion [] 33

Comment: _____

_____

Recommendation 26

"That the Ministry encourage Districts to organize special inservice programs on computer applications for school administrators."

Agree [] Disagree [] No Opinion [] 34

Comment: _____

_____

POLICY GUIDE FOR PRESERVICE:

The Ministry should expect that all student teachers will have the opportunity to learn through, with, and about computers, and be able to use computers in the school classroom.

Agree [] Disagree [] No Opinion [] 35

Comment: _____

_____

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Agree [] Disagree [] No Opinion [] 36

Comment: _____

_____

Recommendation 28

"That the Ministry encourage the Faculties of Education to carry out research into new and effective ways of integrating computer technology into the curriculum."

Agree [] Disagree [] No Opinion [] 37

Comment: _____

_____

TERM OF REFERENCE H

"Explore the communication requirements necessary to ensure effective utilization of computer technology."

POLICY GUIDE:

The Ministry should undertake a broad-based study of the benefits of using computer communications networks and database access. Districts should be guided in their development of networks linking schools with District offices.

Agree [] Disagree [] No Opinion [] 38

Comment: _____

_____

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"That the Ministry provide leadership by establishing the technical specifications for computer communications networks, and by evaluating the benefits of computer communications networks in relation to their costs."

Agree [] Disagree [] No Opinion [] 39

Comment: _____

_____

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Agree [] Disagree [] No Opinion [] 40

Comment: _____

_____

Recommendation 31

"That the Ministry encourage Districts to evaluate the potential benefits of computer communications networks, and where found to be advantageous, encourage the establishment of District networks."

Agree [] Disagree [] No Opinion [] 41

Comment: _____

_____

Recommendation 32

"That, if the results of the recommended evaluations demonstrate the utility of computer communications networks, the Ministry should initiate the development of a province-wide Educational Computer Network."

Agree [] Disagree [] No Opinion [] 42

Comment: _____

_____

TERM OF REFERENCE I

"Determine an implementation strategy and a plan for the integration of computers into the instructional program."

Recommendation 33

THE IMPLEMENTATION PLAN

The Committee recommends the following for the initial five years (September 1, 1987 - June 30, 1992) of a rolling five-year plan. The outcomes of year one should be reviewed, and appropriate adjustments made to years two through five. Year six would then be included in the projection.

The dollar amounts indicated are the best estimates that can be made at this time. They should be viewed as tentative, pending feedback from the review and validation of this Interim Report. The average annual cost is estimated at $25 million, which is approximately $54 per pupil per year, and a total of $125 million for the five-year period. This expenditure is equivalent to an average of $30 per year from each household in the Province. Under current funding arrangements, the average cost would be about $7.50 per household per year.

Agree [] Disagree [] No Opinion [] 43

Comment: _____

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33.1 TEACHER INSERVICE ($3.2 million/year)

Five days of inservice training should be provided for one-fifth (approximately 5,000 teachers) of the entire teaching force in each of the five years.

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The Ministry should request the assistance of the Faculties of Education, the Colleges, the Open Learning Authority, the Teachers' Federation, and other suppliers of inservice training.

Agree [] Disagree [] No Opinion [] 44

Comment: _____

_____

33.2 SOFTWARE ($3.0 million/year)

The Ministry should immediately assist Districts in ensuring the legality of all educational software currently being used in the Province's schools.

The Ministry should establish review procedures to identify appropriate links between the existing school curriculum and currently-available computer applications. The findings of the review should be incorporated into the school curriculum as quickly as possible.

The Ministry should identify the most frequently-used software packages, and then negotiate site licenses, bulk purchases, or software development contracts to ensure that software is available to schools at minimum cost.

The Ministry should increase the flow of information to teachers about the availability of appropriate classroom applications of software.

The Ministry should expand the functions of the Provincial Educational Media Centre to include the acquisition, evaluation, and distribution of educational software.

Agree [] Disagree [] No Opinion [] 45

Comment: _____

_____

33.3 HARDWARE ($12 million/year)

There should be the overall objective of purchasing an average of 6,000 microcomputer systems per year for the five-year period, 1987 - 1992. The average cost for a computer workstation is estimated at $2,000. The total acquisition of 30,000 computers would provide a ratio of one computer for every 16 students. The combination of the new purchases and those already in the schools, would result in a ratio of approximately one computer for every 12 students. This compares to proposals for a 1:8 ratio by 1985 in the Province of Alberta, and for a 1:7 ratio by 1990 in the Ottawa Board of Education.

At the completion of the five-year period:

1. Each medium to large senior secondary school in the Province should have at least three microcomputer laboratories with a minimum of 15 workstations. Additional computers for classroom applications should be provided on the basis of demonstrated need. Smaller senior secondary schools should have facilities scaled to their specific requirements.

2. Each medium to large junior secondary school in the Province should have at least two microcomputer laboratories with a minimum of 15 workstations. Additional computers for classroom applications should be provided on the basis of demonstrated need. Smaller junior secondary schools should have facilities scaled to their specific requirements.

3. Each elementary school in the Province should have a minimum of one microcomputer system per classroom. These may be dispersed through the school in appropriately-designed classroom locations, or in a dedicated laboratory. It will be necessary to increase this ratio for small elementary schools to ensure an adequate minimum number of computers.

4. All documented requirements for computing equipment for special education and learning assistance purposes should be satisfied.

5. Each school library in the Province should have a microcomputer system connected to a modem for networking and database access.

6. The upgrading of obsolete and unreliable computing equipment should be an ongoing process.

Agree [] Disagree [] No Opinion [] 46

Comment: _____

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33.4 COORDINATION AND MAINTENANCE ($3 million/year)

Coordination of District computer activities is essential, and may be provided by a single person (either full or part time) or by a coordinating committee. A formal training program for District computer coordinators should be developed and administered by the Ministry.

Depending on the size of the school, one or more school-based computer resource persons should be identified for each school in the Province. The role of the computer resource person should be defined by the District. A formal training program for school resource persons should be developed by the Ministry and administered by the Districts. The training of school resource persons should be provided by the District in sequence with the installation of new computers into the schools.

Computer technicians for each District should be identified and provided with the training necessary for limited maintenance services.

Agree [] Disagree [] No Opinion [] 47

Comment: _____

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33.5 PHYSICAL PLANT ($2.8 million/year)

The Ministry should immediately undertake a comprehensive survey of the alterations to buildings that will be necessary to provide for the recommendations of this Report.

Specific standards should be established for each area of the school where computers may be operated, including classrooms, laboratories, and special education rooms. These standards should include specifications for: space, lighting, climate control, health and safety, furniture (ergonomics), electrical supply, access, and security. Each District should then develop a formal plan for the required upgrading of its physical plant, and submit the plan to the Ministry for approval and funding. These standards would be applied to all new school construction.

Agree [] Disagree [] No Opinion [] 48

Comment: _____

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33.6 COMMUNICATIONS ($500,000/year for two years)

Public network access should be expanded to include all Districts.

Each District, where appropriate, should establish a computer communications network linking all of its schools, within Ministry guidelines.

Because the benefits of a Provincial network are difficult to quantify in relation to the costs, the Ministry should undertake studies, and support pilot projects directed toward assessing network operations and database applications. A decision to proceed to a full network would be based on the results of the pilots.

Agree [] Disagree [] No Opinion [] 49

Comment: _____

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33.7 CURRICULUM DEVELOPMENT AND INTEGRATION ($200,000/year)

The Ministry should direct the Curriculum Development Branch to undertake the steps necessary to support the integration of computer applications into the school curriculum.

Agree [] Disagree [] No Opinion [] 50

Comment: _____

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33.8 RESEARCH & DEVELOPMENT, AND EVALUATION ($600,000/year)

The Ministry should establish an educational technology centre with responsibility for acquiring and disseminating information, software evaluation, contracting for research and development activities in support of computer applications, and evaluating the progress of all programs and activities recommended in this Report. This office should be commissioned to function as a central information centre. It should regularly provide teachers with a broad range of information on educational computer applications.

Agree [] Disagree [] No Opinion [] 51

Comment: _____

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General Comments: _____

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THANK YOU